

Product Summary

$V_{(BR)DSS}$	$R_{DS(on)TYP}$	I_D
40V	2.3m Ω @10V	120A
	3.3m Ω @4.5V	



合肥矽普半导体

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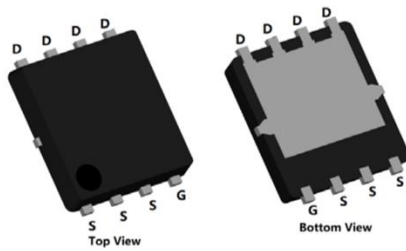
Feature

- Fast Switching
- Low Gate Charge and Rdson
- **AEC-Q101** qualified
- Advanced Split Gate Trench Technology
- **100% UIS TESTED**

Applications

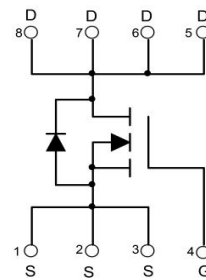
- DC-DC Converters
- Power management functions
- Synchronous-rectification applications

Package



PDFN5X6-8L

Circuit diagram



Marking



40N02BGKA :Device Code
****** :Week Code

Order Information

Device	Package	Unit/Tape
SP40N02BGNKA	PDFN5X6-8L	5000

Absolute maximum ratings (Ta=25°C, unless otherwise noted)

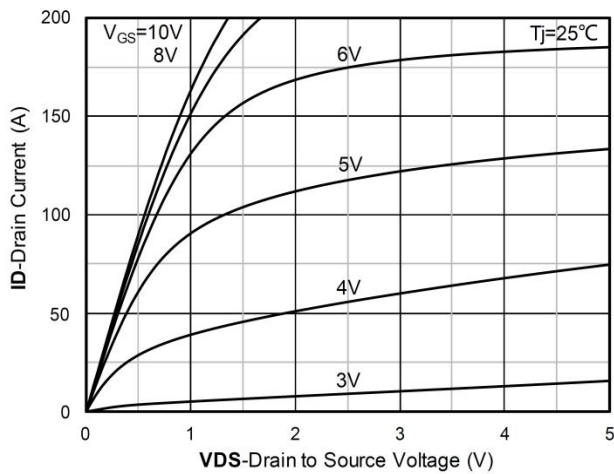
Parameter		Symbol	Rating	Units
Drain-Source Voltage		V _{DS}	40	V
Gate-Source Voltage		V _{GS}	±20	V
Continuous Drain Current1(T _C =25°C)	Package Limit	I _D	120	A
Continuous Drain Current1(T _C =25°C)	Silicon Limit	I _D	130	A
Continuous Drain Current (T _c =100°C)		I _D	80	A
Pulse Drain Current Tested		I _{DM}	480	A
Single pulsed avalanche energy ¹		E _{AS}	162	mJ
Power Dissipation (T _c =25°C)		P _D	85	W
Power Dissipation (T _c =100°C)		P _D	42.5	W
Thermal Resistance Junction-to-Case		R _{θJC}	1.76	°C/W
Thermal Resistance Junction-to-Ambient		R _{θJA}	58	°C/W
Storage Temperature Range		T _{STG}	-55 to 175	°C
Operating Junction Temperature Range		T _J	-55 to 175	°C

Electrical characteristics (Ta=25°C, unless otherwise noted)

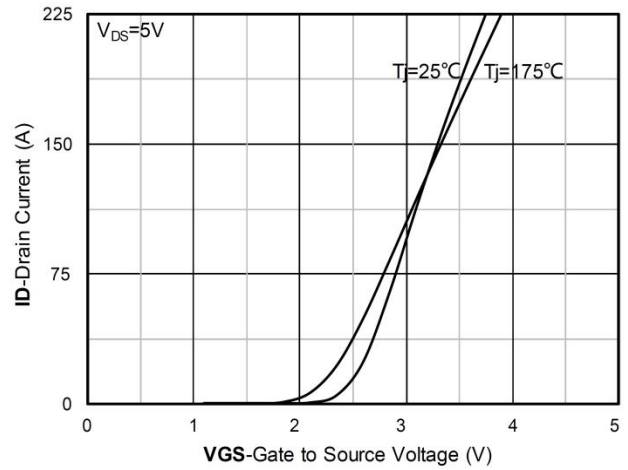
Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
Static Characteristics						
Drain-Source Breakdown Voltage	BV _{DSS}	VGS=0V , ID=250uA	40	45	-	V
Drain-Source Leakage Current	IDSS	VDS=40V , VGS=0V , TJ=25℃	-	-	1	uA
Gate-Source Leakage Current	IGSS	VGS=±20V , VDS=0V	-	-	±100	nA
Gate Threshold Voltage	VGS(th)	VGS=VDS , ID=250uA	1.3	1.7	2.3	V
Static Drain-Source On-Resistance	RDS(ON)	VGS=10V , ID=50A	-	2.3	2.8	mΩ
Static Drain-Source On-Resistance	RDS(ON)	VGS=4.5V , ID=50A	-	3.3	4.0	mΩ
Gate Resistance	RG	f=1MHz	-	2.0	-	Ω
Dynamic characteristics						
Input Capacitance	Ciss	VDS=20V , VGS=0V , f=1MHz	-	2868	-	pF
Output Capacitance	Coss		-	798	-	
Reverse Transfer Capacitance	Crss		-	87	-	
Total Gate Charge	Qg	VDS=20V , VGS=10V , ID=50A	-	40	-	nC
Gate-Source Charge	Qgs		-	10	-	
Gate-Drain Charge	Qgd		-	12	-	
Gate Plateau Voltage	Vplateau		-	4.3	-	V
Switching Characteristics						
Turn-On Delay Time	Td(on)	VDD=20V , VGS=10V , RG=1.9Ω , ID=50A	-	14	-	nS
Rise Time	Tr		-	16	-	
Turn-Off Delay Time	Td(off)		-	25	-	
Fall Time	Tf		-	13	-	
Diode Characteristics						
Diode Forward Voltage	VSD	VGS=0V , IS=1A , TJ=25℃	-	-	1.2	V
Diode Continuous Current	IS		-	-	120	A
Reverse recover time	Trr	IS=50A, di/dt=100A/us, TJ=25℃	-	42	-	nS
Reverse recovery charge	Qrr		-	38	-	nC

Note :
1. The test condition is V_{DD}=15V, V_{GS}=10V, L=0.5mH, R_G=25Ω;

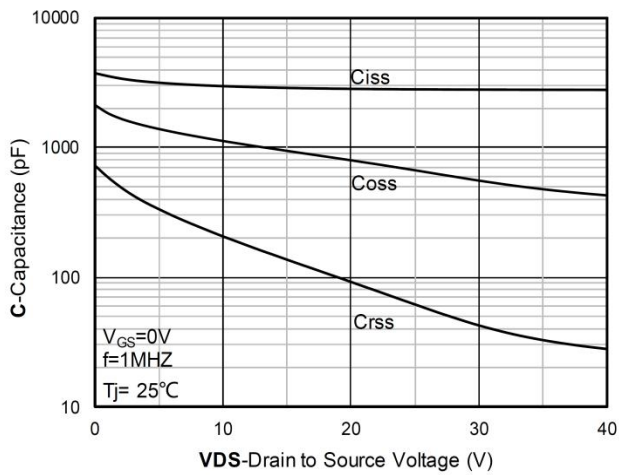
Typical Characteristics



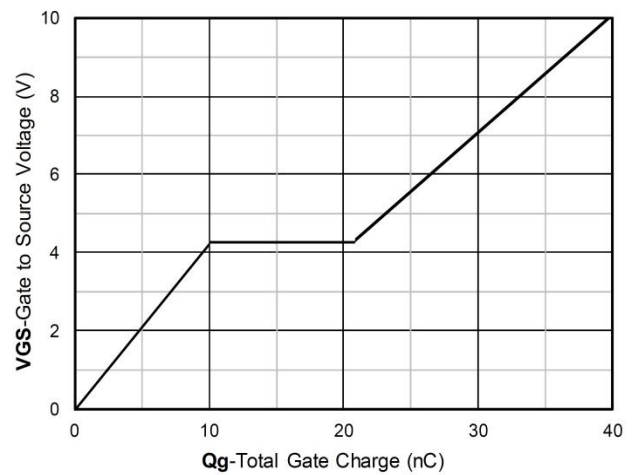
Output Characteristics



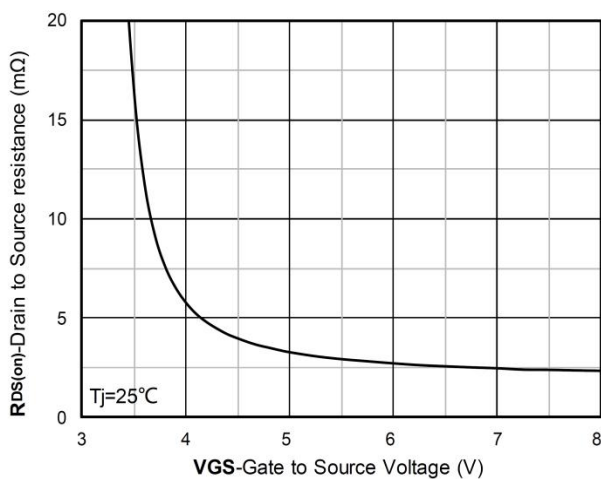
Transfer Characteristics



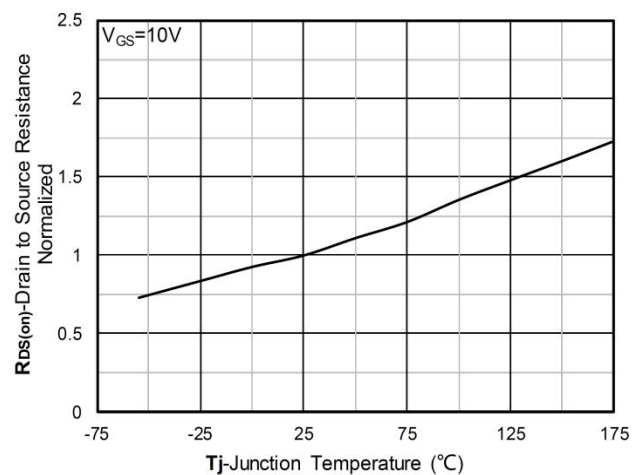
Capacitance Characteristics



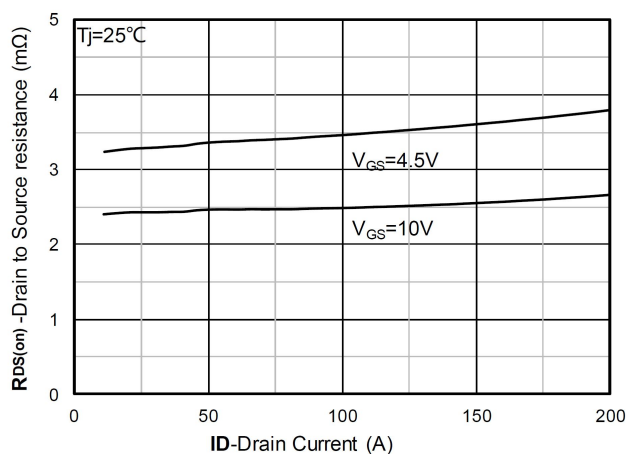
Gate Charge



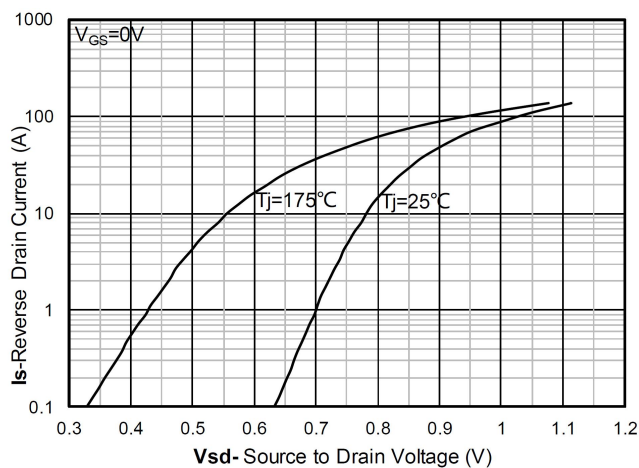
On-Resistance vs Gate to Source Voltage



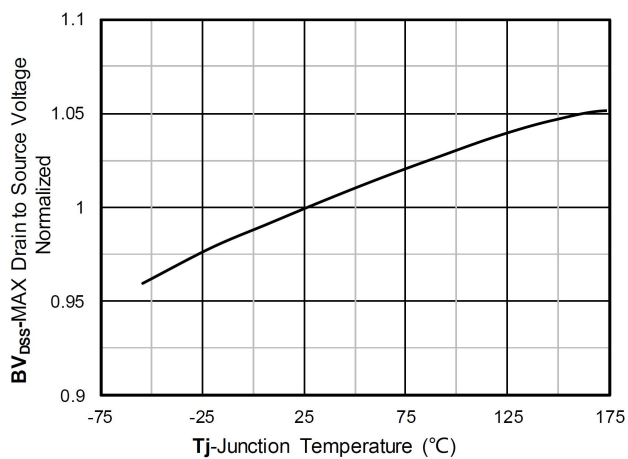
Normalized On-Resistance



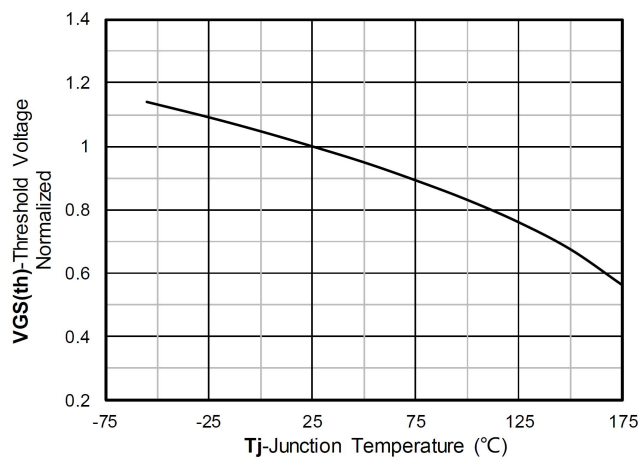
RDS(on) VS Drain Current



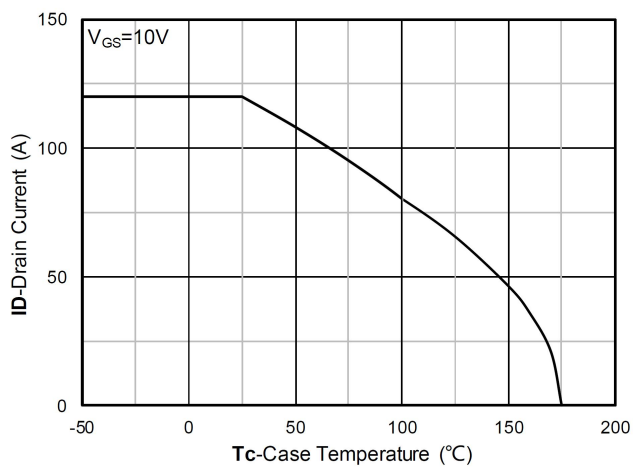
Forward characteristics of reverse diode



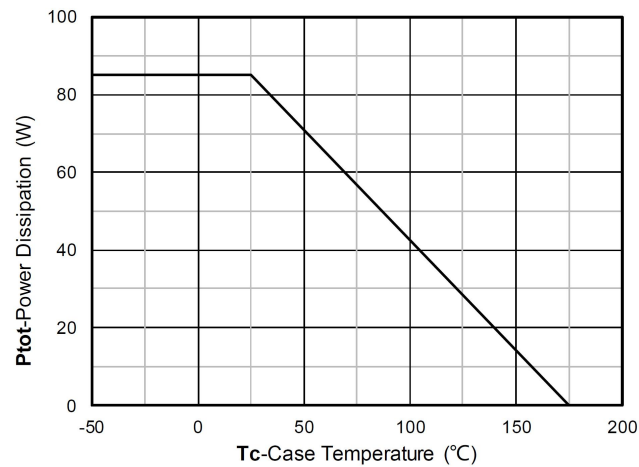
Normalized breakdown voltage



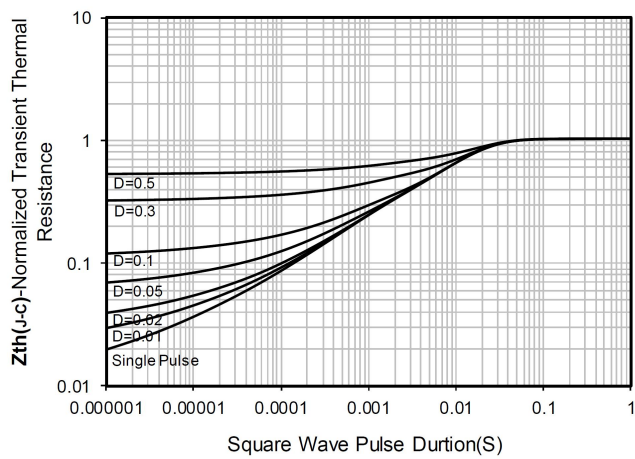
Normalized Threshold voltage



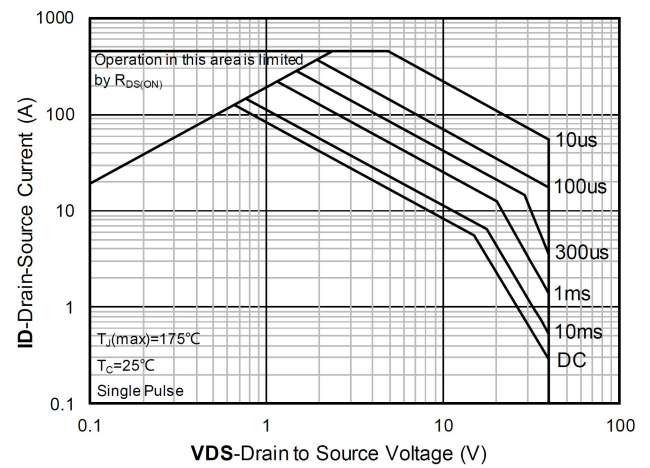
Current dissipation



Power dissipation



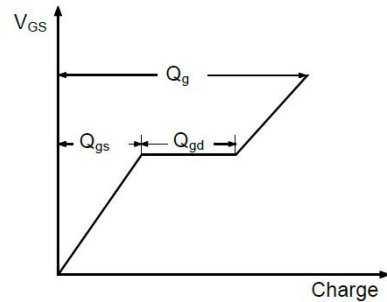
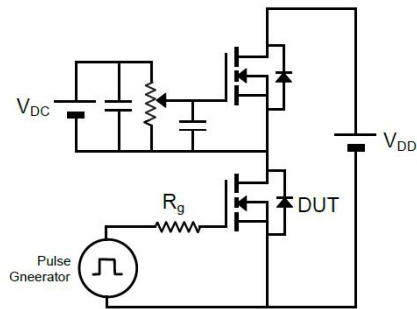
Maximum Transient Thermal Impedance



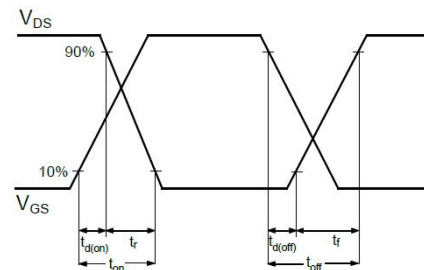
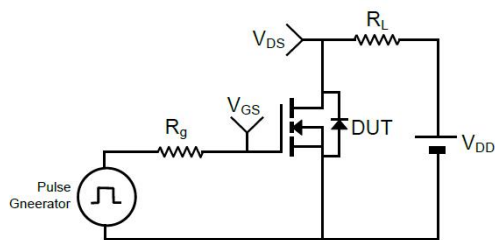
Safe Operation Area

Test Circuit

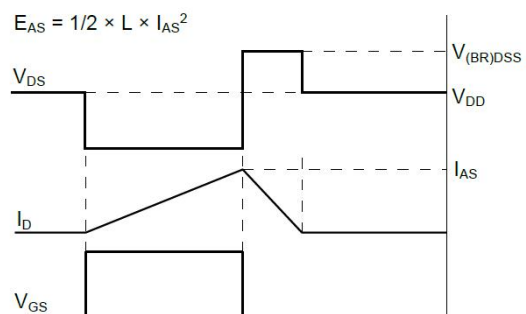
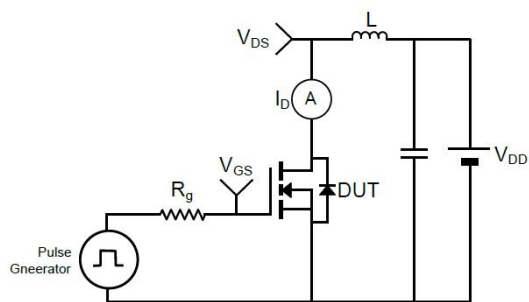
Gate Charge



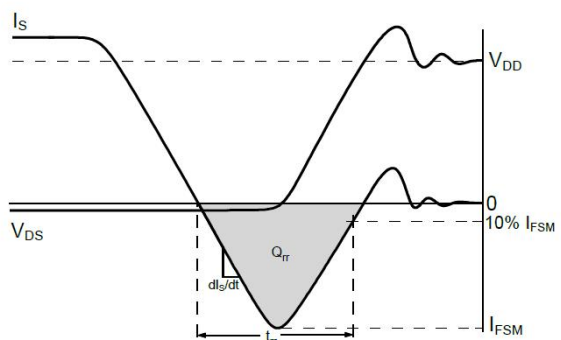
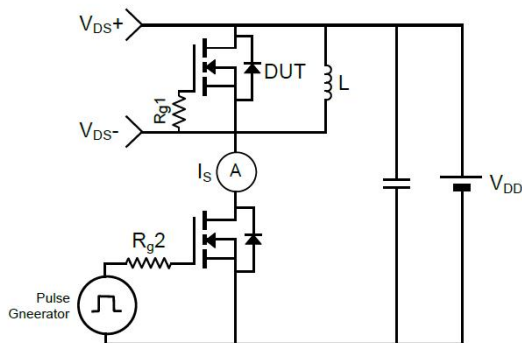
Resistive Load Switching Time

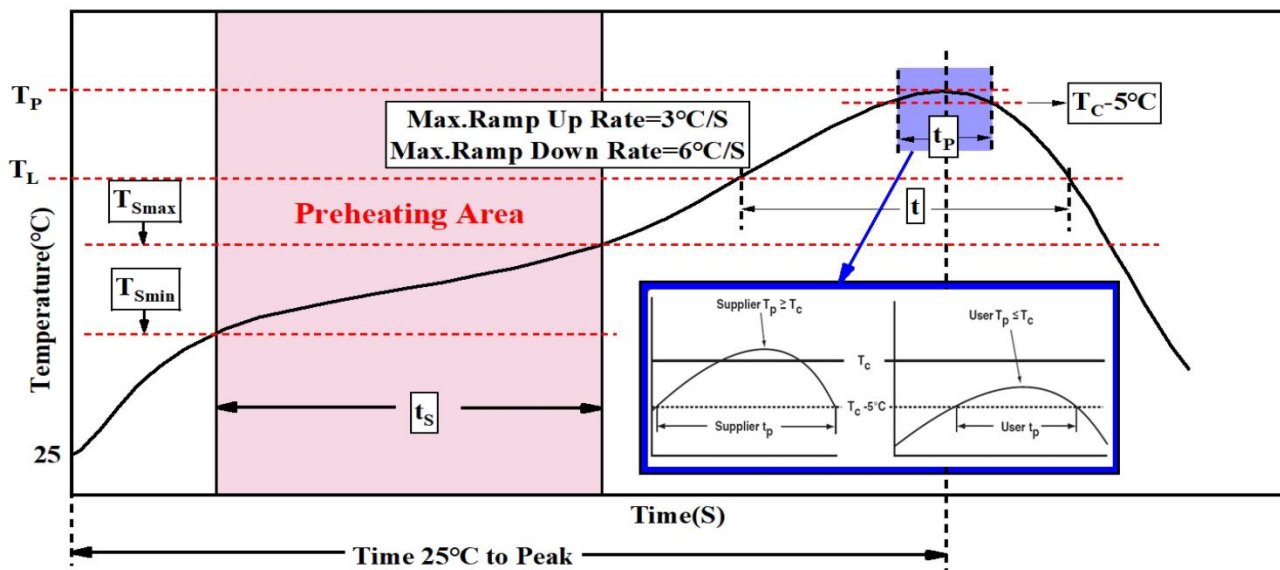


Un-clamped Inductive Load Switching



Drain-Source Body Diode Reverse Recovery



Temperature Profile for IR Reflow Soldering


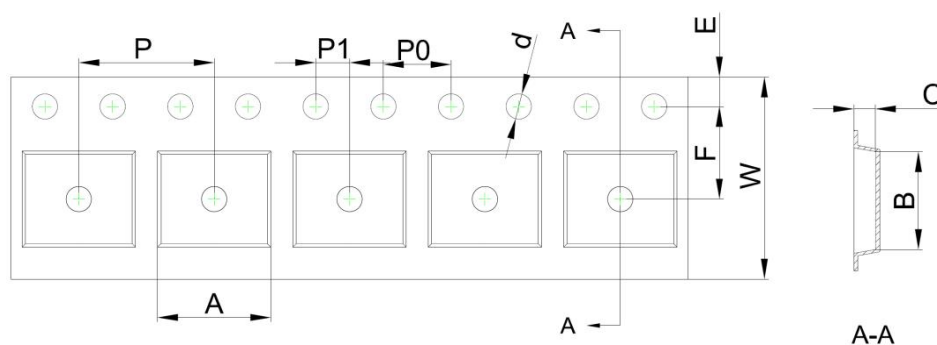
Profile Feature	Sn-Pb Eutectic Assembly	Pb-Free Assembly
Preheat & Soak		
Temperature min (T_{smmin})	100°C	150°C
Temperature max (T_{smmax})	150°C	200°C
Time (T_{smmin} to T_{smmax}) (t_s)	60-120 seconds	60-120 seconds
Average ramp-up rate (T_{smmax} to T_p)	3 °C/second max.	3°C/second max.
Liquidous temperature (T_L)	183 °C	217°C
Time at liquidous (t_L)	60-150 seconds	60-150 seconds
Peak package body Temperature e (T_p)*	See Classification Temp in table 1	See Classification Temp in table 2
Time (t_p)** within 5°C of the specified classification temperature (T_c)	20** seconds	30** seconds
Average ramp-down rate (T_p to T_{smmax})	6 °C/second max.	6 °C/second max.
Time 25°C to peak temperature	6 minutes max.	8 minutes max.
* Tolerance for peak profile Temperature (T_p) is defined as a supplier minimum and a user maximum. ** Tolerance for time at peak profile temperature (t_p) is defined as a supplier minimum and a user maximum		

Table 1. SnPb Eutectic Process – Classification Temperatures (T_c)

Package Thickness	Volume mm^3 <350	Volume mm^3 ≥ 350
<2.5 mm	235 °C	220 °C
≥ 2.5 mm	220 °C	220 °C

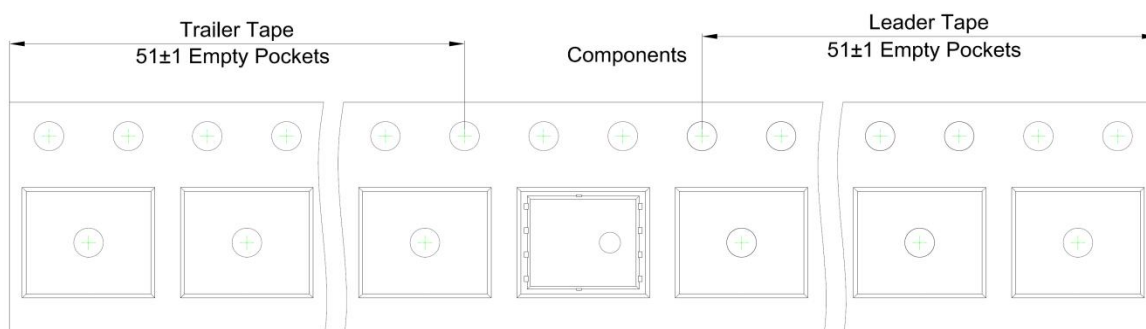
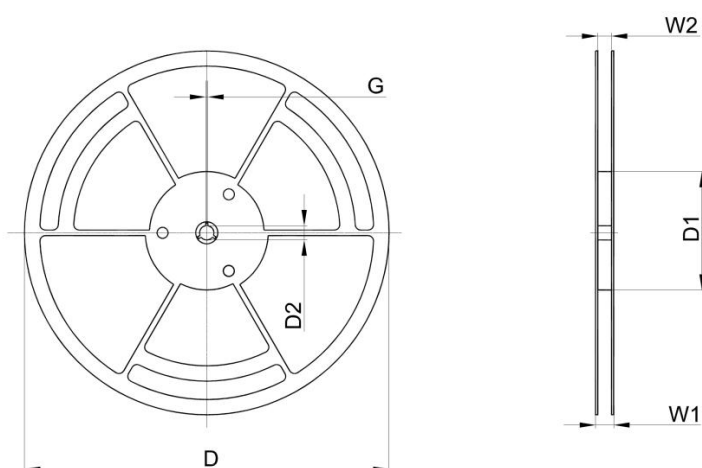
Table 2. Pb-free Process – Classification Temperatures (T_c)

Package Thickness	Volume mm^3 <350	Volume mm^3 350-2000	Volume mm^3 >2000
<1.6 mm	260 °C	260 °C	260 °C
1.6 mm – 2.5 mm	260 °C	250 °C	245 °C
≥ 2.5 mm	250 °C	245 °C	245 °C

PDFN5X6-8L Embossed Carrier Tape


Dimensions are in millimeter

Pkg type	A	B	C	d	E	F	P0	P	P1	W
PDFN5X6-8L	6.30	5.30	1.10	Φ1.50	1.75	5.50	4.00	8.00	2.00	12.00

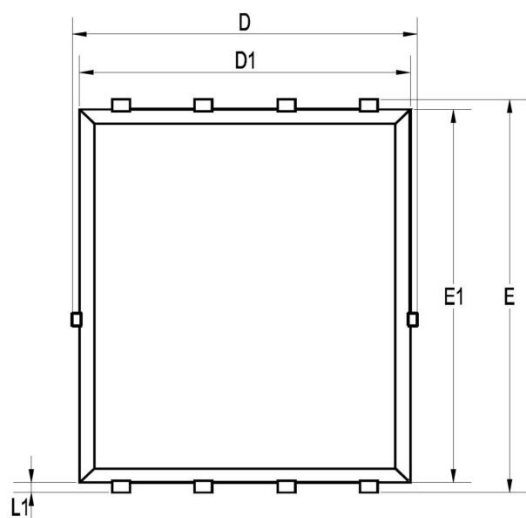
PDFN5X6-8L Tape Leader and Trailer

PDFN5X6-8L Reel


Dimensions are in millimeter

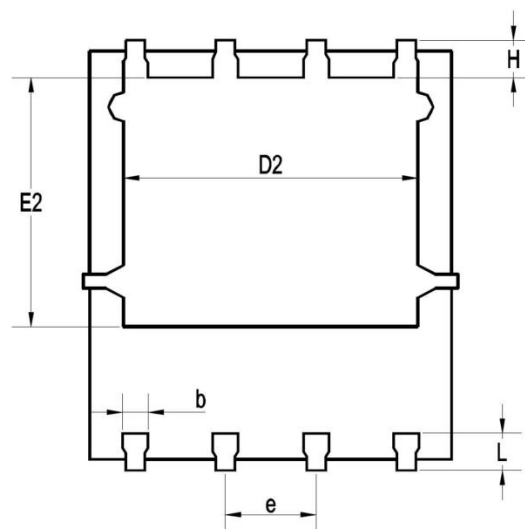
Reel Option	D	D1	D2	G	W1	W2
13"Dia	Ø330.00	100.00	13.00	1.90	17.60	12.40

REEL	Reel Size	Box	Box Size(mm)	Carton	Carton Size(mm)
5,000 pcs	13 inch	5,000 pcs	340×336×29	50,000 pcs	353×346×365

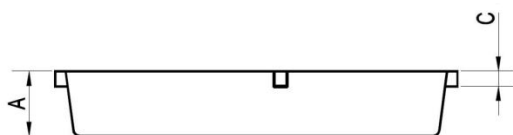
PDFN5X6-8L Package Information



Top View
[顶视图]



Bottom View
[背视图]



Side View
[侧视图]

Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	0.900	1.200	0.035	0.047
b	0.330	0.510	0.013	0.020
C	0.110	0.340	0.004	0.013
D	4.700	5.260	0.185	0.207
D1	4.700	5.100	0.185	0.201
D2	3.560	4.500	0.140	0.177
E	5.750	6.250	0.226	0.246
E1	5.600	6.000	0.220	0.236
E2	3.180	3.660	0.125	0.144
e	1.170	1.370	0.046	0.054
L	0.350	0.750	0.014	0.030
L1	0.000	0.200	0.000	0.008
H	0.350	0.710	0.014	0.028